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Synthesis and Study of Structural, Morphological, and Electrochemical Properties of Ceria co-doped for SOFC Applications

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Abstract : Polycrystalline samples of Ce1-xMxO2-δ (x=0.1, 0.15, 0.2)(M=Gd, Y) were prepared by solid-state chemical reaction from mixtures of pre-dried oxides powders of CeO2, Gd2O3 and Y2O3 in the appropriate stoichiometric ratio to explore their use as solid electrolytes for intermediate temperature solid oxide fuel cells (IT-SOFCs). Their crystal structures and ionic conductivities were characterised by X-ray powder diffraction (XRD) and AC complex impedance spectroscopy (EIS). The XRD analyses confirm that all the resulting synthesised co-doped cerium oxide powders are single-phase and crystallise in the cubic structure system with the space group Fm3m. On the one hand, the lattice parameter (a) of the phases increases with increasing Gd content; on the other hand, with increasing Y-substitution rate, the latter decreases. The results of complex impedance conductivity measurements have shown that doping has a remarkable effect on conductivity. The co-doped cerium phases showed significant ionic conductivity values, making these materials excellent candidates for solid oxide electrolytes at intermediate temperatures.

Keywords : electrolyte, Ceria, X-ray diffraction, EIS, SEM, SOFC
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